THE HR DIAGRAM OF ABNORMAL A-TYPE STARS

Eugenio E. Mendoza V.

Instituto de Astronomia, Universidad Nacional
Autonoma de Mexico

We have observed over a hundred A-type stars in the $\prec(16)\Lambda(9)$-photometric system defined by Mendoza (1976a, b; 1977). These stars also have UBVRI measurements. Sixty five stars have been observed in the thirteen color-photometric system (Mendoza 1971, and Johnson and Mitchell 1975).

The analysis of these narrow, intermediate and broad-band photometric measures could include many comparisons of the several color indices. Thus, for instance, Am stars are separated in the (V-I, U-V)-plot (Mendoza et al. 1977). A-type supergiants are separated in the (40-52, 37-52)-plane (Mendoza 1971). A-type supergiants, Ae (Herbig 1960), Am and Ap stars are separated very neatly in the $\prec(16)\Lambda(9)$-diagram as illustrated in Fig. 1.

The Am and Ap stars are located on the main sequence in H$\prec$- photometry ($\prec(16)$-index). An interpretation of the neutral oxygen triplet (7774 Å)-photometry ($\Lambda(9)$-index) of Am and Ap stars is that they are oxygen underabundant at the surface layers, as compared with normal main sequence A-stars. Ap stars, under this interpretation will have less oxygen than Am stars in the observed stellar atmospheric layers.

The photometric measures under discussion could be affected by emissions and, or by interstellar extinction. In many cases interstellar extinction can be corrected.

A correction to the $\prec(16)$-index, for high luminosity class-stars can be derived when it is contaminated by emission,

A. G. Davis Philip and D. S. Hayes (eds.), The HR Diagram, 289-291.

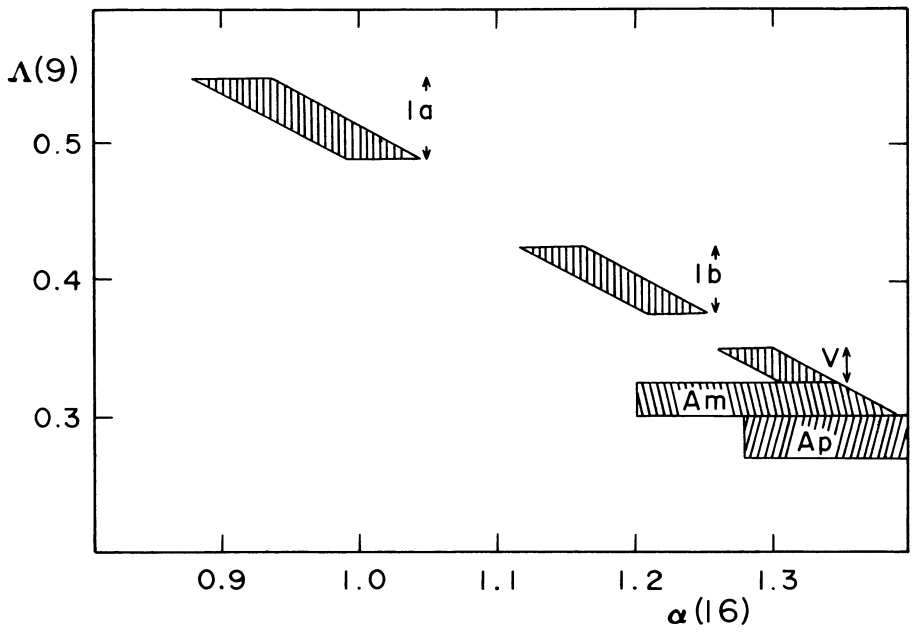

Fig. 1. A schematic diagram for A-type stars in the $\alpha(16)\Lambda(9)$-plane. The Ae stars lie far to the left and below the Ap sequence.

provided that there is no emission contamination in the $\Lambda(9)$-index. For this purpose, we can use the relationship between spectral type, luminosity class and the (16)-index given schematically in Fig. 2. Thus, to locate an A-type supergiant star on the HR diagram we proceed as follows:

1) Correct the photometric data for interestellar extinction, if any. Standard procedures may be used (see Johnson 1968).

2) The OI-photometry gives the correct luminosity, provided that the $\Lambda(9)$-index is not contaminated by emission.

3) Correct the Hα-line for emission, if any, through the $\Lambda(9)$-index.

The Ae (Herbig 1960) stars such as V380 Orionis are more difficult to locate in the HR diagram with precision because both indices $\alpha(16)$ and $\Lambda(9)$ are contaminated by emission.

REFERENCES

Herbig, G.H. (1960). Astrophys. J. Suppl. 4, 337.

https://doi.org/10.1017/S0074180900145681 Published online by Cambridge University Press

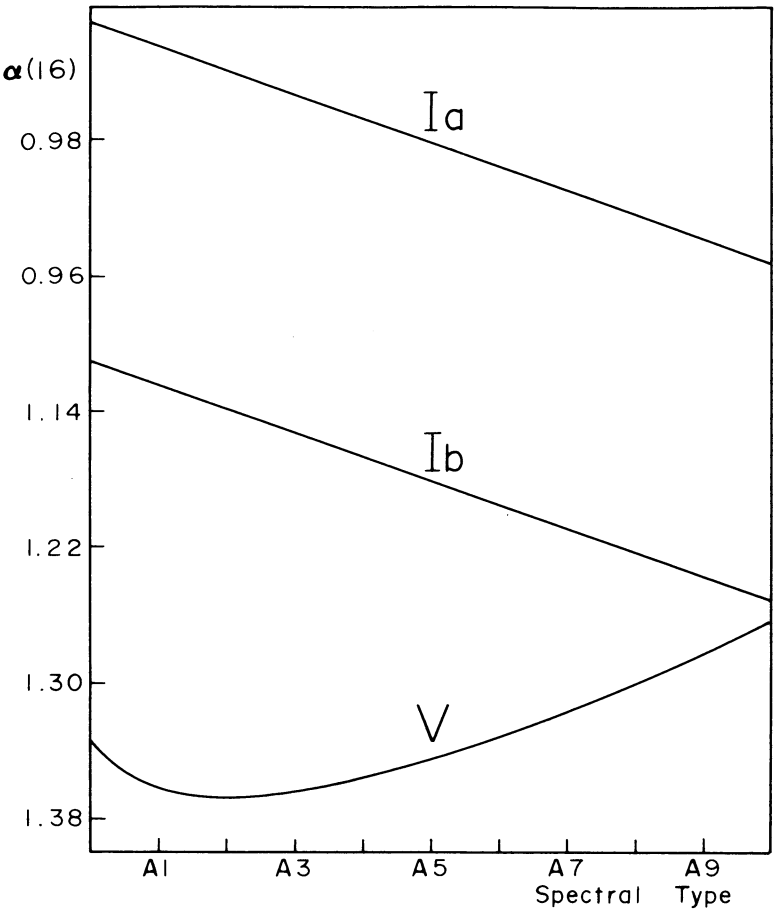

Fig. 2. Mean (16)-index values for 3 luminosity classes.

Johnson, H.L. (1968). In Stars and Stellar Systems, Vol. VII, Nebulae and Interstellar Matter, B.M. Middlehurst and L.H. Aller, eds., University of Chicago Press, Chicago, p. 167.
Johnson, H.L. and Mitchell, R.I. (1975). Rev. Mex. Astron. Astrof. 1, 299.
Mendoza, E.E. (1971). In The Magellanic Clouds, A.B. Muller, ed., D. Reidel, Dordrecht, p. 69.
Mendoza, E.E. (1976a). Rev. Mex. Astron. Astrof. 2, 29.
Mendoza, E.E. (1976b). Rev. Mex. Astron. Astrof. 2, 33.
Mendoza, E.E. (1977). Rev. Mex. Astron. Astrof. 2, 287.
Mendoza, E.E., Gomez, T. and Gonzalez, S. (1977). In preparation.

https://doi.org/10.1017/S0074180900145681 Published online by Cambridge University Press